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Examiner: Philpott, Justin M.

In the claims

Please amend the claims as follows:

1. (currently amended) A telecommunications network element having a stack of multiple levels of protocol structures, said stack comprising:

a ~~first~~ signaling protocol structure including a selected level of a signaling protocol operable to effectuate signaling communication over a signaling network ~~using a signaling protocol~~;

an IP-based transport protocol ~~second~~ structure, including an Internet Protocol (IP)-based transport protocol operable to transport said signaling communication across a packet-switched network using an Internet Protocol (IP)-based transport protocol, said IP-based transport protocol including a plurality of IP-based messages; and

a peer-to-peer protocol adaptation (PPA) structure ~~associated with said first and second structures, said PPA structure operating to convert said signaling communication between said signaling protocol and said IP-based messages, said PPA structure including functionality to facilitate~~ operable to generate and transmit messages to said signaling protocol structure and to said IP-based protocol structure and to receive and process messages from said protocol structures, thereby performing signaling processing with the IP-based protocol structure and with the signaling protocol structure ~~said first structure to locally within the network element process said signaling protocol's signaling messages.~~

2. (original) The telecommunications network element as set forth in claim 1, wherein said signaling protocol comprises an access signaling protocol.

3. (currently amended) The telecommunications network element as set forth in claim 12, wherein said ~~access~~ signaling protocol comprises Signaling System No. 7 and said selected level comprises Level 3 Message Transfer Part (MTP3). ~~Q.931 protocol associated with at least one of an Integrated Services Digital Network (ISDN) and Primary Rate Interface (PRI) media.~~

4. (original) The telecommunications network element as set forth in claim 1, wherein said signaling protocol comprises a common channel signaling protocol.

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5. (original) The telecommunications network element as set forth in claim 4, wherein said common channel signaling protocol comprises Signaling System No. 7 (SS7) protocol associated with switched circuit network.

6. (original) The telecommunications network element as set forth in claim 5, wherein said switched circuit network comprises a wireline telephony network.

7. (original) The telecommunications network element as set forth in claim 5, wherein switched circuit network comprises a wireless telephony network.

8. (original) The telecommunications network element as set forth in claim 5, wherein said IP-based transport protocol comprises Stream Control Transmission Protocol (SCTP).

9. (original) The telecommunications network element as set forth in claim 8, wherein said PPA structure includes means to convert transmission sequence numbers used by said SCTP protocol to message sequence numbers used by said SS7 protocol.

10. (original) The telecommunications network element as set forth in claim 9, wherein said message sequence numbers used by said SS7 protocol include forward sequence numbers.

11. (original) The telecommunications network element as set forth in claim 9, wherein said message sequence numbers used by said SS7 protocol include backward sequence numbers.

12. (original) The telecommunications network element as set forth in claim 8, wherein said PPA structure includes means for generating User Data messages based on Message Signal Units provided by said SS7 protocol, said User Data messages being operable to be transported by using said SCTP protocol.

13. (original) The telecommunications network element as set forth in claim 8, wherein said PPA structure includes means for generating Link Status messages based on Link Status Signal Units provided by said SS7 protocol, said Link Status messages being operable to be transported by using said SCTP protocol.

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14. (original) The telecommunications network element as set forth in claim 8, wherein said PPA structure includes mapping means to maintain a map between an SS7 communication link and its corresponding SCTP association.

15. (currently amended) A telecommunications network, comprising:
a first network portion operable to transport signaling messages using Signaling System No. 7 (SS7) protocol;
a second network portion based on Internet Protocol (IP), said second network portion being operable to transport said signaling messages using Stream Control Transmission Protocol (SCTP); and
a signaling gateway disposed between said first and second network portions, said signaling gateway including a peer-to-peer protocol adaptation (PPA) structure operable to interwork between said SS7 protocol and SCTP messaging, wherein said PPA structure provides an ~~Level 2 Message Transfer Part (MTP2)~~ interface between a Level 3 MTP (MTP3) layer of said SS7 protocol and said SCTP protocol, the interworking of said PPA structure including functionality to locally process functions associated with an Level 2 Message Transfer Part (MTP2) layer.

16. (original) The telecommunications network as set forth in claim 15, wherein said signaling gateway is coupled to a signaling endpoint (SEP) disposed in said first network portion.

17. (original) The telecommunications network as set forth in claim 15, wherein said signaling gateway is coupled to a Signal Transfer Point (STP) disposed in said first network portion.

18. (original) The telecommunications network as set forth in claim 15, wherein said signaling gateway is coupled to a Signal Switching Point (SSP) disposed in said first signaling network.

19. (original) The telecommunications network as set forth in claim 15, wherein said signaling gateway is coupled to an IP-signaling point (IPSP) disposed in said second network portion.

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20. (original) The telecommunications network as set forth in claim 19, wherein said IPSP comprises an IP-based Service Control Point (IPSCP).

21. (original) The telecommunications network as set forth in claim 19, wherein said IPSP comprises an IP-based signaling endpoint (IPSEP).

22. (original) The telecommunications network as set forth in claim 15, wherein said signaling gateway is coupled to a media gateway controller (MGC) disposed in said second network portion.

23. (original) An Internet Protocol (IP)-based telecommunications network for transporting Signaling System No. 7 (SS7) signaling information to effectuate an Intelligent Network (IN)-capable service architecture, comprising:

a first IP signaling point (IPSP) having a Level 3 Message Transfer Part (MTP3) functionality associated therewith;

a second IP signaling point (IPSP) having a Level 3 Message Transfer Part (MTP3) functionality associated therewith;

an IP-based virtual link coupling said first and second IPSPs, said IP-based virtual link being operable to propagate messages using Stream Control Transmission Protocol (SCTP); and

each of said first and second IPSPs including a peer-to-peer protocol adaptation (PPA) structure operable to interwork between corresponding IPSP's MTP3 functionality and said SCTP protocol, wherein said PPA structure provides a Level 2 Message Transfer Part (MTP2) interface to said MTP3 functionality, said PPA structure including functionality to locally process functions associated with said MTP2 interface.

24. (original) The IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 23, wherein said first IPSP comprises an IP signaling endpoint (IPSEP).

25. (original) The IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 23, wherein said second IPSP comprises an IP Service Control Point (IPSCP).

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26. (original) The IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 23, wherein said first IPSP comprises a signaling gateway disposed in an SS7 signaling network.

27. (original) The IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 23, wherein said second IPSP comprises an IP media gateway controller (MGWC).

28. (new) The telecommunications network as set forth in claim 15, wherein said second network portion includes an IP-based network element having a second one of said peer-to-peer protocol adaptation (PPA) structures.

29. (original) The IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 23, wherein said second IPSP comprises an IP Signal Transfer Point (IPSTP).

30. (currently amended) A method of transporting Signaling System No. 7 (SS7) signaling information over an Internet Protocol (IP)-based network, comprising the steps of:

establishing a virtual link across an IP connection between two nodes, said virtual link being operable to propagate messages using Stream Control Transmission Protocol (SCTP);

verifying said virtual link's integrity by one of said two nodes;

interworking, at each of said two nodes, between a Level 3 Message Transfer Part (MTP3) functionality and said SCTP protocol by a peer-to-peer protocol adaptation (PPA) structure provided thereat, the interworking by said PPA including exchanging messages with said (MTP3) functionality and with said SCTP protocol, including for performing said verifying of the virtual link's integrity, and said interworking operating to convert SS7 signal bearer traffic into a stream of SCTP messages; and

loading said virtual link with said stream of SCTP messages for propagation between said two nodes over said virtual link.

31. (currently amended) The method of transporting SS7 signaling information over an IP-based network as set forth in claim 30, further comprising the steps of:

determining if a predetermined quality condition associated with said virtual link between said two nodes is degraded by a select amount; and

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if so, suspending said stream of SCTP messages on said virtual link and establishing an alternative link between said two nodes, ~~and~~ and propagating said signal bearer traffic over said alternative link.

32. (original) The method of transporting SS7 signaling information over an IP-based network as set forth in claim 31, wherein said alternative link comprises an IP-based link.

33. (original) The method of transporting SS7 signaling information over an IP-based network as set forth in claim 31, wherein said alternative link comprises an SS7 link.

34. (original) The method of transporting SS7 signaling information over an IP-based network as set forth in claim 30, wherein one of said two nodes comprises an IP Signal Transfer Point (IPSTP).

35. (original) The method of transporting SS7 signaling information over an IP-based network as set forth in claim 30, wherein one of said two nodes comprises an IP signaling endpoint (IPSEP).

36. (original) The method of transporting SS7 signaling information over an IP-based network as set forth in claim 30, wherein one of said two nodes comprises an IP Service Control Point (IPSCP).

37. (original) The method of transporting SS7 signaling information over an IP-based network as set forth in claim 30, wherein one of said two nodes comprises an IP media gateway controller (MGWC).

38. (currently amended) A computer-accessible medium operable with a signaling node, said computer-accessible medium carrying a sequence of operations which, when executed by a processing entity associated with said signaling node, causes said signaling node to perform the steps of:

establishing a virtual link across an IP connection associated with said signaling node, said virtual link being operable to propagate messages using Stream Control Transmission Protocol (SCTP);

verifying said virtual link's integrity by said signaling node;

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interworking, at said signaling node, between a Level 3 Message Transfer Part (MTP3) functionality and said SCTP protocol by a peer-to-peer protocol adaptation (PPA) structure provided thereat, the interworking by said PPA including exchanging messages with said (MTP3) functionality and with said SCTP protocol, including for performing said verifying of the virtual link's integrity, and said interworking operating to convert SS7 signal bearer traffic into a stream of SCTP messages; and

loading said virtual link with said stream of SCTP messages for propagation over said virtual link associated with said signaling link.

39. (original) The computer-accessible medium operable with a signaling node as set forth in claim 38, further including instructions for performing the steps of:

determining if a predetermined quality condition associated with said virtual link is degraded by a select amount;

if so, suspending said stream of SCTP messages on said virtual link and establishing an alternative link associated with said signaling node; and

propagating said signal bearer traffic over said alternative link.

40. (original) The computer-accessible medium operable with a signaling node as set forth in claim 39, wherein said alternative link comprises an IP-based link.

41. (original) The computer-accessible medium operable with a signaling node as set forth in claim 39, wherein said alternative link comprises an SS7 link.

42. (original) The computer-accessible medium operable with a signaling node as set forth in claim 38, wherein said signaling node comprises an IP Signal Transfer Point (IPSTP).

43. (original) The computer-accessible medium operable with a signaling node as set forth in claim 38, wherein said signaling node comprises an IP signaling endpoint (IPSEP).

44. (original) The computer-accessible medium operable with a signaling node as set forth in claim 38, wherein said signaling node comprises an IP Service Control Point (IPSCP).

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45. (original) The computer-accessible medium operable with a signaling node as set forth in claim 38, wherein said signaling node comprises an IP media gateway controller (MGWC).

46. (currently amended) A link changeover method in an IP-based telecommunications network for transporting SS7 signaling information, said network including a local node and a remote node, wherein each of said nodes includes an MTP3 structure, an M2PA structure, and an SCTP structure, comprising the steps of:

establishing a link between said local and remote nodes by creating an association therebetween;

detecting, by at least one of said local and remote nodes, that a select condition related to said association has occurred;

receiving, by an M2PA structure in one of said nodes, a message from the MTP3 structure in said one node, requesting a selected sequence number;

determining said selected sequence number, by said M2PA structure in said one node, by locating the first gap in selected messages;

responsive to said detection step and said determining, exchanging message sequence number information between said local and remote nodes on an alternative link established therebetween; and

based on said message sequence number information, retransmitting messages over said alternative link, said messages starting at a predetermined sequence number.

47. (original) The link changeover method in an IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 46, wherein said message sequence number information comprises SCTP sequence number information.

48. (original) The link changeover method in an IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 46, wherein said message sequence number information comprises SS7 sequence number information.

49. (original) The link changeover method in an IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 48, wherein said SS7 sequence number information comprises Forward Sequence Number information.

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50. (original) The link changeover method in an IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 48, wherein said SS7 sequence number information comprises Backward Sequence Number information.

51. (original) The link changeover method in an IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 48, wherein said select condition related to said association comprises a Quality of Service (QoS) condition.

52. (original) The link changeover method in an IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 48, wherein said select condition related to said association comprises a link failure condition.

53. (original) The link changeover method in an IP-based telecommunications network for transporting SS7 signaling information as set forth in claim 48, wherein said select condition related to said association comprises a link reliability condition.